Polar and Rectangular Coordinates
Lesson 22
3.17.16-3.21.16
9.3

Converting Polar Coordinates to Rectangular Coordinates	The rectangular coordinates (x, y) of a point named by the polar coordinates (r, θ) can be found by using the following formulas. $x = r\cos\theta$ $y = r\sin\theta$

I try:

Find the rectangular coordinates of each point

$$P\left(5, \frac{\pi}{3}\right)$$

Identify givens	$r =$ $\theta =$
Plug into equations $x = rcos\theta$ $y = rsin\theta$	$x =$ $y =$

We Try:
Find the rectangular coordinates of each point

$$P(-13, -70°)$$

Identify givens	$r =$ $\theta =$
Plug into equations $x = rcos\theta$ $y = rsin\theta$	$x =$ $y =$

You Try:

Find the rectangular coordinates of each point

$$P\left(-10, -\frac{3\pi}{2}\right)$$

Converting Rectangular Coordinates to Polar Coordinates	The polar coordinates (r, θ) of a point named by the rectangular coordinates (x, y) can be found by the following formulas. $r = \sqrt{x^2 + y^2}$ $\theta = \text{Arctan}\ \frac{y}{x}$, when $x > 0$ $\theta = \text{Arctan}\ \frac{y}{x} + \pi$, when $x < 0$

Find the polar coordinates of each point

$$R(-8, -12)$$

Identify givens	$x =$ $y =$
Plug into equations $r = \sqrt{x^2 + y^2}$ $\theta = \tan^{-1}\frac{y}{x}$	$r =$ $\theta =$

We Try:
Find the polar coordinates of each point

$$R(10,-5)$$

Identify givens	$x =$ $y =$
Plug into equations $r = \sqrt{x^2 + y^2}$ $\theta = \tan^{-1}\frac{y}{x}$	$r =$ $\theta =$

You Try:

Find the polar coordinates of each point

$$R(3,0)$$

Identify givens	$x =$ $y =$
Plug into equations $r = \sqrt{x^2 + y^2}$ $\theta = \tan^{-1}\frac{y}{x}$	$r =$ $\theta =$

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Memorize these formulas.

$$r^2 = y^2 + x^2$$
$$x = r\sin\theta$$
$$y = r\cos\theta$$

I Try:
Write the polar equation as a rectangular one.

$$r = 6\cos\theta$$

$r = 6\cos\theta$	
Multiply both sides by r	
Substitute for $r^2 = x^2 + y^2$ And $r\cos\theta = x$	

We Try:
Write the polar equation as a rectangular one.

$$r = 3\sin\theta$$

$r = 3\sin\theta$	
Multiply both sides by r	
Substitute for $r^2 = x^2 + y^2$ And $r\sin\theta = y$	

You Try:

Write the polar equation as a rectangular one.

$$r = 2$$

$r = 2$	
Multiply both sides by r	
Substitute for $r^2 = x^2 + y^2$ And $r\sin\theta = y$	

I Try:

Write the rectangular equation $(x+3)^2+y^2=9$ as a polar equation.

$(x+3)^2+y^2=9$	
Substitute for $x=rsin\theta$ $y=rcos\theta$ Or $r^2=x^2+y^2$	
Foil	
Simplify	

We Try:

$$x=-7$$

$x=-7$	
Substitute for $x=rsin\theta$ $y=rcos\theta$ Or $r=x^2+y^2$	
Simplify	

We Try:

$$x^2-y^2=25$$

$x=-7$	
Substitute for $x=rsin\theta$ $y=rcos\theta$	

Simplify	

You Try:

$$x^2 + (y-3)^2 = 36$$

$x = -7$	
Substitute for $x = rsin\theta$ $y = rcos\theta$	
Simplify	

Exit Ticket:

1) Write the rectangular equation, $(x-2)^2 + y^2 = 16$ as a polar equation.

2) Write the polar equation as a rectangular one.

$$r = 3sin\theta$$